Ten myths about Functional Neurological Disorder

european journal of neurology
the official journal of the european academy of neurology

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Journal:	*European Journal of Neurology*
Manuscript ID	EJoN-20-0838
Wiley - Manuscript type:	Letters to the Editor
Date Submitted by the Author:	27-Apr-2020
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Keywords:	Functional disorders < Psychiatric disorders < NEUROLOGICAL DISORDERS, conversion disorder, functional movement disorder, psychogenic, myths

Ten myths about Functional Neurological Disorder

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Word count: 1590

Key words: functional neurological disorder; functional movement disorder; myths; diagnosis; treatment; psychogenic; conversion disorder

Figures: 0

Tables: 0

Running title: Ten myths of FND

Functional neurological disorder (FND), is the second most common reason for referral to a neurologist. Despite being potentially treatable, FND remains underdiagnosed and associated with high levels of disability and distress. In this article, we address ten common myths about FND that continue to obstruct the diagnosis and treatment for these patients, and present them with accompanying lessons for the clinician.

Myth 1: FND is a diagnosis of exclusion

The diagnosis of FND should be approached in the same way as other medical conditions and be diagnosed using positive features, rather than by ruling out other conditions.(1) Positive signs on examination include Hoover's sign of functional limb weakness, where hip extension weakness returns to normal when attention is diverted to the contralateral leg. Functional tremor may 'entrain' to the frequency of imposed rhythmic movements in another body part. Functional (dissociative) seizures can be recognised by a combination of typical features such as eyes tightly closed during an episode, long duration, or awareness of generalized shaking. Thus, the diagnosis of FND should be based primarily on typical features only seen in this disorder or internal inconsistency of the symptoms and signs.(2)
Lesson: The diagnosis of FND should be "ruled in" based on the presence of positive signs.

Myth 2: Patients have either FND or another neurological disorder

The presence of another neurological condition is a powerful risk factor for the development of FND and they commonly occur together. Physical injury, surgical procedures and migraine often precipitate functional movements in vulnerable individuals, and up to 20% of patients with functional (dissociative) seizures also have epilepsy.(3) Some conditions like Parkinson's disease appear particularly likely to present with comorbid FND, perhaps because of shared neurobiology, but symptoms and disability from any neurological condition may be sufficient. For this reason, there should be a low threshold for investigations.
Lesson: FND commonly co-occurs with other neurological disorders.

Myth 3: A bizarre presentation indicates FND

FND is frequently equated to bizarre or unrecognizable clinical neurological presentations, such as complex movement disorders. In fact, several genetic or acquired movement disorders present with strikingly bizarre phenomenology.(4–6) In such cases, the "bizarreness" is not the key to the diagnosis, but rather it is that the bizarre pattern remains consistently present, despite variations in task performance, or with distraction. Conversely, the key to recognizing FND is the variability of the symptoms and signs across different situations over time and within the physical examination itself. In addition, in the case of functional movement disorders, the movements are not inherently more bizarre, they just abide by their own rules, and therefore can also produce recognizable phenotypes. For example, functional facial dystonia is remarkably identical amongst patients.(7)

Lesson: A bizarre presentation does not equate to a diagnosis of FND.

Myth 4: Different phenotypes of FND indicate different disorders

Various presentations of FND are commonly defined as the functional correlates of known neurological signs, e.g. a functional tremor, dystonia, seizures, etc. However, given the shared risk factors among patients with FND, it is more likely that these different phenotypes represent a variable expression of the same underlying disorder (FND), manifesting differently in different individuals. FND is often accompanied by the presence of pain, fatigue, cognitive symptoms, and/or other systemic functional symptoms. Recognizing this broader FND syndrome can be helpful diagnostically in challenging cases, particularly in complex presentations that do not neatly conform to known phenotypes.
Lesson: Functional symptoms are often part of a broader FND syndrome including pain, fatigue, and cognitive symptoms.

Myth 5. FND symptoms are voluntary

FND symptoms do arise from the voluntary nervous system which is one reason why concerns about exaggeration or malingering persist in many doctor's minds when thinking about FND. Multiple convergent evidence suggests that feigning is a highly improbable reason for these symptoms including studies showing dysfunction of brain regions involved in movement planning, attention, body monitoring and sense of agency in patients with FND, in contrast with observations in experimental feigning.(14,17,18) Neurophysiological studies, differential recovery in randomised trials, and consistent presentations and comorbidities across cultures and across time are all supportive of FND as a distinct clinical brain disorder, and not a result of voluntary feigning of symptoms.
Lesson: FND symptoms are involuntary; patients are not "putting them on" and feigning is rare.

Myth 6: There is no role for investigations in the diagnosis of FND

Having a low threshold for investigations is important because additional neurological disease, such as radiculopathy or demyelination, is such a strong risk factor for FND. Care must be taken in explaining to patients why investigations are being done and to prepare the patient for potentially incidental findings. Laboratory-supported criteria can also be helpful in difficult cases, such as the presence of a cortical *Bereitschaftspotential* in functional myoclonus which suggests use of self-initiated movement pathways. Electromyography can be useful in detecting positive signs such as coherence, distractibility or entrainment in functional tremor, which can then be demonstrated to the patient. Video electroencephalography is helpful in differentiating epileptic and functional (dissociative) seizures. Ideally, the FND diagnosis is presented before the outcome of the investigations to highlight that it is a 'rule-in' diagnosis.

Lesson: Investigations can be useful to identify co-morbid neurological conditions, diagnose phenotypically challenging cases, and reinforce positive signs to the patient.

Myth 7: There is less harm in missing a diagnosis of FND than missing another neurological disease

There is often the perception that it is worse to miss a diagnosis of another neurological disease than a functional disorder. Published frequencies of misdiagnosing FND has been consistently around 4% from the early 1970s to 2005, similar to other neurological and psychiatric disorders, with even lower rates in more recent studies(8). To put this into perspective, the rate of misdiagnosis of Parkinson's disease in tertiary centres is approximately 25%, at least upon the initial contact.(9,10) It is appropriate to be concerned about missing any diagnosis, particularly in young and disabled patients, and especially when potentially treatable like FND. Misdiagnosis of patients with FND with diseases such as multiple sclerosis occurs just as commonly and can lead to just as much harm.(11,12)
Lesson: FND is not misdiagnosed more than other conditions. Erroneously diagnosing FND as another neurological condition can be as harmful as the reverse.

Myth 8: FND is exclusively a psychological problem caused by psychological factors

For much of the 20th century Freud's conversion hypothesis – that FND arises from a psychological conflict converted into physical symptoms – has been dominant. More recent work shows that a history of adverse life experience and psychological comorbidities are commonly seen in this population, but they do not occur in all patients, and even when present may not be relevant.(13) This is now reflected in the DSM-5 diagnostic criteria which no longer requires the patient to have a psychological stressor.(14) In addition psychological/psychiatric comorbidities are also common in other neurological disorders.(15–17) Just as hypertension and smoking are risk factors for stroke – disease comorbidity, health anxiety and stress are risk factors for FND. FND is a complex and heterogeneous disorder, with multiple potential biological and psychological causes and mechanisms that vary hugely between patients and which challenges conventional dualistic assumptions about the brain and mind.
Lesson: Psychological factors are one of many possible risk factors for FND and should not be considered the sole etiological cause.

Myth 9: The prognosis of FND is usually good

There tends to be a perception that in FND 'nothing is wrong' or that, with treatment, all patients ought to improve. As in any neurological condition, there is a spectrum of disease severity treatment response but many studies show the majority of patients being the same or worse at follow-up.(8) Patients with FND have levels of disability and impairment in quality of life similar to those with similar debilitating conditions such as Parkinson's disease or epilepsy(18) which commonly includes chronic pain, fatigue, cognitive problems and psychological comorbidity.

Lesson: Patients with FND are as disabled and have as impaired quality of life as patients with other neurological conditions. When left untreated, prognosis is unfavourable for most.

Myth 10: The treatment of FND is solely referral to a psychologist or psychiatrist

FND patients require individualized treatment, beginning with a transparent and carefully explained diagnosis. This should avoid simply telling the patient what they don't have or jumping to conclusions about aetiology. Demonstration of positive signs to the patient can alter fundamental views about the nature and potential reversibility of the condition. As in other neurological conditions a multidisciplinary approach is often required for more complex cases.(19) Physical therapy alone is effective in some patients with functional movement disorders and has promising early data from randomised trials, even in patients with long duration symptoms.(20) There is an evidence base for psychological therapy in functional (dissociative) seizures(21) which may also be essential when anxiety, mood, or personality disorders are comorbid. Identifying and triaging patients with dominant pain or fatigue syndromes is important, as these may need to be the initial focus of treatment. In some severe cases, the main treatment focus may be on support and prevention of iatrogenic harm from unnecessary medication or interventions.
Lesson: FND treatment is individualized and involves careful explanation combinations of physical and psychological rehabilitation.

Conclusion

FND is a common condition, lying at the interface of neurology and psychiatry. A clear diagnosis delivered in a timely manner can have a strong positive impact on the patient's symptoms, prognosis, and quality of life. Patients can improve with individualized, multidisciplinary treatment. Attitudes and practices are changing but the many misconceptions that surround FND continue to obstruct good medical care for these patients.

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Lesson: Functional symptoms are often part of a broader FND syndrome including pain, fatigue, and cognitive symptoms.

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FND symptoms ~~are perceived as involuntary but~~do arise from the voluntary nervous system which is one reason why concerns about exaggeration or malingering persist in many doctor's minds when thinking about FND. Multiple convergent evidence suggests that feigning is a highly improbable reason for these symptoms including studies showing dysfunction of brain regions involved in movement planning, attention, body monitoring and sense of agency in patients with FND, ~~which~~ in contrast~~vary~~ with ~~those seen~~observations in experimental feigning.(14,17,18) Neurophysiological studies, differential recovery in randomised trials, and consistent presentations and comorbidities across cultures and across time are all supportive of FND as a distinct clinical brain disorder, and not a result of voluntary feigning of symptoms.
Lesson: FND symptoms are involuntary; patients are not "putting them on" and feigning is rare.

Myth 6: There is no role for investigations in the diagnosis of FND

~~Investigations can be useful in establishing a diagnosis of FND.~~ Having a low threshold ~~to do so~~for investigations is ~~reasonable~~ important because ~~as mentioned,~~ additional neurological disease, such as radiculopathy or demyelination, is such a strong risk factor for FND. ~~Imaging should be done primarily to look for the presence of additional neurological disease, such as radiculopathy or demyelination.~~ Care must be taken ~~in how investigations are framed to the patient, since they do not change the diagnosis of FND~~in explaining to patients why investigations are being done and to prepare the patient for potentially incidental findings~~, or in the event that incidental findings are discovered~~. ~~such as the clinically silent multiple sclerosis or root lesion contributing to the clinical picture. Having a low threshold to do so is reasonable because as mentioned, neurological disease is such a strong risk factor for FND.~~ Laboratory-supported criteria can also be helpful in difficult cases, such as the presence of a cortical *Bereitschaftspotential* in functional myoclonus which

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Lesson: Investigations can be useful to identify co-morbid neurological conditions, diagnose phenotypically challenging cases, and reinforce positive signs to the patient.

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There is often the perception that it is worse to miss a diagnosis of another neurological disease than a functional disorder. Published frequencies of misdiagnosing FND has been consistently around 4% from the early 1970s to 2005, similar to other neurological and psychiatric disorders, with even lower rates in more recent studies(8). To put this into perspective, the rate of misdiagnosis of Parkinson's disease in tertiary centres is approximately 25%, at least upon the initial contact.(9,10) It is appropriate to be concerned about missing any diagnosis, particularly in young and disabled patients, and especially when potentially treatable like FND. Misdiagnosis of patients with FND with diseases such as multiple sclerosis occurs just as commonly and can lead to just as much harm.(11,12)
Lesson: FND is not misdiagnosed more than other conditions. Erroneously diagnosing FND as another neurological condition can be as harmful as the reverse.

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For much of the 20th century Freud's conversion hypothesis — that FND arises from ~~is~~ a psychological conflict converted into physical symptoms – has been dominant. More recent work shows that a history of adverse life experience and psychological comorbidities are commonly seen in this population, but they do not occur in all patients, and even when present may not be relevant.(132) This is now reflected in the DSM-5 diagnostic criteria which no longer requires the patient to have a psychological stressor.(143) In addition psychological/psychiatric comorbidities are also common in other neurological disorders.(154–176) Just as hypertension and smoking are risk factors for stroke – disease comorbidity, health anxiety and stress are risk factors for FND. FND is a complex and heterogenous ~~neuropsychiatric~~ disorder, ~~best approached from a biopsychosocial perspective with predisposing, precipitating and perpetuating factors~~ with multiple potential biological and psychological causes and mechanisms that vary hugely between patients and which challenges conventional dualistic assumptions about the brain and mind.
Lesson: Psychological factors are one of many possible risk factors for FND and should not be considered the sole etiological cause.

Myth 9: The prognosis of FND is usually good

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Commented [JS3]: The word neuropsychiatric unfortunately causes a lot of confusion both with patients and neurologists who assume it means psychiatric
Like psychosomatic I have no problem with the word in its true meaning, but this is about communicating the right message
I think it would be best to leave out
I have antibodies to biopsychosocial as well but for different reasons – I think a biopsychosocial formulation should be used for all conditions in my medical practice. When its highlighted specially for FND we are reinforcing a stereotype that we need to use it more in this condition than in others. Also when neurologists see that word they mentally glaze over in my experience!

There tends to be a perception that in FND 'nothing is wrong' or that, with treatment, all patients ought to improve. As in any neurological condition, there is a spectrum of disease severity treatment response but many studies show the majority of patients being the same or worse at follow-up.(8) Patients with FND have levels of disability and impairment in quality of life similar to those with similar debilitating conditions such as Parkinson's disease or epilepsy(187) which commonly includes chronic pain, fatigue, cognitive problems and psychological comorbidity. Lesson: Patients with FND are as disabled and have as impaired quality of life as patients with other neurological conditions. When left untreated, prognosis is unfavourable for most.

Myth 10: The treatment of FND is solely referral to a psychologist or psychiatrist

FND patients require individualized treatment, beginning with a transparent and carefully explained diagnosis. This should avoid simply telling the patient what they don't have or jumping to conclusions about aetiology. Demonstration of positive signs to the patient can alter fundamental views about the nature and potential reversibility of the condition. As in other neurological conditions a multidisciplinary approach is often required for more complex cases.(198) Physical therapy alone is effective in some patients with functional movement disorders and has promising early data from randomised trials, even in patients with long duration symptoms.(2019) There is an evidence base for psychological therapy in functional (dissociative) seizures(210) which may also be essential when anxiety, mood, or personality disorders are comorbid. Identifying and triaging patients with dominant pain or fatigue syndromes is important, as these may need to be the initial focus of treatment. In some severe cases, the main treatment focus may be on support and prevention of iatrogenic harm from unnecessary medication or interventions. Lesson: FND treatment is individualized and involves careful explanation combinations of physical and psychological rehabilitation.

Conclusion

FND is a common condition, lying at the interface of neurology and psychiatry ~~and is best approached from a biopsychosocial perspective.~~ ~~neurological condition encountered in any neurology practice.~~ A clear diagnosis delivered in a timely manner can have a strong positive impact on the patient's symptoms, prognosis, and quality of life. Patients can improve with individualized, multidisciplinary treatment. Attitudes and practices are changing but the many misconceptions that surround FND continue to obstruct good medical care for these patients.

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Response to reviewers

Reviewer: 1

COMMENTS TO AUTHOR(S)
The article is a helpful summary of important myths in an easily readable format suitable for the general neurologist and will hopefully help challenge those myths.

I had some minor comments only:
This sentence does not quite flow easily; explaining Hoover's sign after hip abductor sign
(Positive signs on examination include Hoover's sign or abductor sign of functional limb weakness, where hip extension weakness returns to normal when attention is diverted to the contralateral leg.

This has now been corrected to:
Positive signs on examination include Hoover's sign of functional limb weakness, where hip extension weakness returns to normal when attention is diverted to the contralateral leg.

For this reason, there should be a low threshold for investigations
As below I feel an addition is important; to have low threshold for investigations but explain beforehand that because FND can co-exist investigation findings do not necessarily change management; and it can be helpful to explain investigations (especially MRI) can have incidental findings; at times after discussion of the incidental findings investigations can be postponed to allow clinical monitoring, e.g. in functional cognitive symptoms and mild functional tremor a review after 6-12 months can replace investigations if decision regarding investigations are shared decisions with patients.

the clinically silent multiple sclerosis or root lesion contributing to the clinical picture.
Reviewer: I do not see how clinically silent MS contributes to a clinical picture. That is radiologically isolated syndrome. It can lead to a clinical picture but as above careful conversation before investigation is done can help tremendously in dealing with results of investigations.

We thank the reviewer for these excellent points. We have changed the section to highlight this:

Having a low threshold for investigations is important because additional neurological disease, such as radiculopathy or demyelination, is such a strong risk factor for FND. Care must be taken in explaining to patients why investigations are being done and to prepare the patient for

potentially incidental findings.

which vary with those seen in experimental feigning.
Reviewer: Is it meant to say: contrasts or differs to those seen?

Yes – thank you for picking this up, the sentence has been corrected.

Lesson: FND is not misdiagnosed more than other conditions. Erroneously diagnosing FND as another neurological condition can be as harmful as the reverse.
Reviewer: possible relevant reference to: how to undiagnose neurological disease (coebergh et al Practical Neurology
We thank the reviewer for this additional reference, which we have now added to the revision.

This sentence does not quite flow:
More recent work shows that a history of adverse life experience and psychological comorbidities are
commonly seen in this population, (MISSING: BUT) they do not occur in all patients, and even when present may not be relevant.(12)

Agreed – this has been added.

Overall however with minor adjustments on how to decide/explain investigations a helpful, easy to read letter for the general neurologist.

We thank the reviewer for the favorable review and helpful suggestions which have improved the manuscript.

Reviewer: 2

COMMENTS TO AUTHOR(S)
I have read this article with interest as the topic of FND is of great importance to the clinical neurosciences. This article is well written and I agree with well over 90% of what is being conveyed. However, there are some subtle yet very important themes that I do not completely agree with and I am hopeful the authors can consider in more nuanced fashion:

1. Myth 5 (minor comment) - it may be helpful to note that abnormal movements in FND are perceived as involuntary - however clinical features such as tremor entrainment underscore that functional abnormal movements engage volitional motor pathways.

We agree with this point and have altered the text as follows
"FND symptoms are perceived as involuntary but do arise from the voluntary nervous system which is one reason why concerns about exaggeration or malingering may persist in many doctors' minds when thinking about FND"

2. Myth 8 (major comment) - is not entirely a myth in my opinion. In some patients, FND is a condition where psychological factors are the primary drivers of the disorder (some patients will tell us this themselves!). As examples, we can think about patients whose dissociative seizures overlap considerably with panic attacks with a heightened tremulousness and a dissociative component. We can think of others whose functional neurological symptoms are occurring in the context of traumatic re-experiencing events (flashbacks). I think for Myth 8 it is critically important to be more nuanced to allow for the importance of neurological and psychiatric/psychological viewpoints. The equation for developing FND is highly heterogenous. For some patients, psychological factors are the primary driver of the condition. For others, medical / neurological factors (TBI and dissociative seizures; peripheral limb injury and functional dystonia) may play a stronger role. Where the field has gone wrong previously is forcing onto patients certain etiological models when they are not relevant. I don't know the cause of FND in any patient, but I do find that patients can find this out for themselves in the course of treatment. Sometimes when patients improve they make the psychologically rich formulation for themselves and providers.

3. Related to point 2, the authors note that for some patients psychological factors and life events are not relevant for their clinical picture. Why that can be the case in some, for others life events are relevant and the correlation between adverse early life events and symptom severity offers an alternative perspective of importance (i.e. Roelofs et al AJP 2002; Selkirk et al 2008 Epilepsia; Perez, Matin et al 2017 JNNP). In addition to edits to the body of this section, a quick fix to the Myth 8 statement is to add the word "exclusively" (FND is exclusively a psychological problem caused by psychological factors).

We thank the reviewer for these important comments. We completely agree this should have been more nuanced and that very often psychological factors are drivers for symptom generation and/or maintenance. Here we were addressing the myth about etiology of FND being exclusively "psychological". The reviewer is correct that we should have added the word 'exclusively' to the title, and this has been done.

We have also added the following text to the revised manuscript:
"FND is a complex and heterogeneous disorder, with multiple potential biological and psychological causes and mechanisms that vary hugely between patients, and which challenges conventional dualistic assumptions about the brain and mind.
Lesson: Psychological factors are one of many possible risk factors for FND and should not be considered as the sole etiological cause."

4. Myth 10 could also be more nuanced. Adding in the qualifier "solely" or "exclusively" would more accurately convey the point I think. In some instances, the primary treatment can be referral to a psychotherapist with experience in the management of FND. What you are trying to convey here (which is so important as well) is that the neurologist plays an important role in treatment, including catalyzing treatment engagement. Also - while I've heard many talk about how motor FND can improve with physiotherapy alone, this may be true of patients with modest

symptom burden, acute onset and/or low psychiatric comorbidities. The converse is much more familiar to me - physical and occupational therapists raising concerns that psychiatric/psychological factors are under addressed and impeding treatment

We agree with the reviewer and have now amended the myth title. Unfortunately, the format of this piece requires a simplified discussion of this complex topic. In our experience many patients with motor FMD who improve or partially improve with PT, it is not the PT itself that is the helpful component, rather the education around FND, the disease model, and self-management strategies which are not elements of traditional neurorehabilitation. Thus, the specificity of what is being targeted in physical rehab for FND is not yet well understood.

5. The conclusion: I think that statements such as "FND is a common neurological condition" unqualified does not send the appropriately nuanced message. Not also pointing out that FND "is a common (neuro)psychiatric condition as well" disenfranchises our psychiatry/psychology/social work colleagues who are so needed in the front lines of FND clinical care (and research). I wonder if the authors can consider rephrasing to note that FND is a common condition at the interface of neurology and psychiatry.

We agree, note that we had initially targeted this piece to Neurologists, reflecting the word choice here. We take the reviewer's point and do not want to underemphasize the importance of psychiatry, while also asserting the responsibility of the neurologist in daily practice not to over-estimate the role of psychiatric pathology in these patients. It is a fine line and we have attempted to soften this here:

FND is a common condition, lying at the interface of neurology and psychiatry.